ANNUAL REPORT on EMF ACTVITIES in ITALY (2013)

General research activities related to EMF health

The scientific activities in Italy, presented here, are based on results published in 2013 in peer-reviewed scientific papers, authored or co-authored by researchers affiliated to Italian Universities or research organizations.

Studies on biological effects of EMF exposure

The effects of different sources of EMF, including GSM signals, Bluetooth and ELF, on nervous system-related endpoints were evaluated in mice, neuron-like/neuroblastoma cell lines, and humans. Effects on mitochondrial trans-membrane potential reduction, heat shock proteins expression, DNA damage, neuronal differentiation, auditory nerve, trans-cranial stimulation and diabetic neuropathy were reported (1-6).

Experimental and clinical studies investigated the effects of pulsed EMF on osteocytes, chondrocytes and mesenchymal stem cells differentiation, inflammatory processes involved in osteoarthritis, aging-associated bone demineralization, tendon cell and cartilage regeneration (7-17).

Effects of ELF and pulsed EMF were also analyzed in the contest of angiogenesis and cell tumor viability (18, 19).

Effects of GSM signals on heart rate variability were described in human volunteers (20).

Studies on exposure assessment, dosimetry and EMF biomedical applications

The studies related to biomedical applications were strongly differentiated. As to the exposure to EMF fields of MRI workers, a numerical survey was published on the motion-induced electric fields experienced by MRI operators, together with a comment on a paper addressing similar item (21, 22). Moreover, a study addressed a procedure to estimate the electric field induced in human body exposed to unknown magnetic sources (23), and another one discussed an experimental-computational technique for evaluating magnetic field distributions around unknown sources (24). The research line on brain stimulation was continued, particularly on Deep Brain Stimulation (25). Moreover, studies addressed the UWB pulse propagation into human tissues (26) and the influence of breathing activity in the evaluation of the EMF absorption in humans exposed to plane waves (27). On a similar issue, a wireless sensing for the respiratory activity of human beings was proposed (28). The role of the change in patient current density distribution was investigated, related to the capacitive coupling between the operating table and the return electrode of an electrosurgery unit (29). Last but not least, setups for in vitro assessment of RFID interference on pacemakers were investigated (30).

The research on EMF interaction mechanisms was mainly focused on the study of nanosecond-scale static and alternating electric field in the gating dynamics of human aquaporin 4 (31), the effect of square-wave electric field on dipolar response and hydrogen-bond kinetics (32) and on translational and rotational diffusive motion in liquid water (33). Moreover, the feasibility of MW energy to affects biological systems via non-thermal mechanisms was addressed (34, 35). One paper addressed the modelling of the triplet flavin-indole electron transfer and interradical dipolar interaction (36). Another study was devoted to the investigation of the effect of high exogenous electric pulses on protein conformation (37). One paper was focused on the microdosimetric study for nanosecond pulsed electric fields on a cell circuit model with nucleus (38), whereas a paper was published as comment on the issue of proving the lightning role in the evolution of life (39).

As to the exposure systems for laboratory investigation, a study reviewed the microwave exposure systems for in vivo biological experiments (40), whereas another one discussed a waveguide applicator for in vitro exposures to single or multiple ICT frequencies (41).

New policies and legislations regarding EMF exposure

At the beginning of 2014, the Ministry of Environment published the Decree of 13 February 2014 "*Institution of the national register of the sources of electric, magnetic and electromagnetic field, aimed at determining the field levels present in the environment*". The national register shall be held by the Higher Institute for Environmental Research and Protection (ISPRA, former Environmental Protection Agency), and shall be based on technical information available in the data-bases of local and regional authorities involved in authorization processes (namely the Regional Agencies for Environmental Protection).

Following the publication in June 2013 of the new Directive 2013/35/UE on workers' protection, (to be enforced by 1 July,2016), a non-binding guidance on occupational EMF risk assessment and management issued in 2009 by the coordination body of regional OSH authorities has been upgraded in February 2014. The basic recommendation is to go on referring to the old Directive 2004/40/EC (now repealed but still present

inside the Italian law, even if not mandatory). At the same time, the guidance provides basic information and technical elements on the new Directive, especially where new concepts or principles have been introduced.

Areas of public concern and national responses

The major concern of the public remains focused on base stations for mobile phones and installation of new Wi-Fi network. The attention on potential risk from mobile phones, even though intensely debated on the media after the sentence of Court of Cassation of October 2012 (see previous reports), remains limited to few categories of people (e.g. patients with brain or head tumours, self-defined electrosensitive subjects, etc.).

The question of the installation of a ground station of the Mobile User Objective System (MUOS) in Niscemi (Sicily), inside a US Navy military base, where other communication plants have already been operated throughout the past years, raised a high concern at national level and produced a very hard to manage situation at local stage, with sharp social tension, public disorder, technical and legal controversy not yet concluded.

The response of the Health Ministry, supporting the regional authority responsible of authorization process, was to develop by the National Institute of Health (ISS) a study on the health status of population living in Niscemi, extended to all potential risk factors. At the same time, a new assessment of current and potential exposures has been performed by ISPRA and ISS. The main result of the study is that exposure from currently operating systems are below the cautionary values established in Italian regulation (6 V/m), and potential emissions from MUOS (basing on theoretical calculation) should even be orders of magnitude lower. The analysis of the health status has shown some critical points in the pattern of mortality and morbidity factors, likely due to chemical pollution transported by prevailing wind motion from large industrial refinery site at around 20 km distance along the coast. Nevertheless, the local population still looks at MUOS as a potentially dramatic cause of illness, and the situation remains critical.

Public information activities

The website *www.iss.it/elet*, promoted by the Ministry of Health and carried out by the National Institute of Health (ISS), is continuing to be regularly upgraded, as well as the web site *www.portaleagentifisici.it* devoted to the occupational safety from all physical agents. The web focus published by Ministry of Health in 2012 to inform the public about that state of art of scientific evidence and promote a responsible use of mobile phones has been extended and upgraded in October 2013.

http://www.salute.gov.it/portale/news/p3_2_3_1_1.jsp?lingua=italiano&menu=dossier&p=dadossier&id=7

The main message is that no risk is established but it cannot be completely ruled out, suggesting practical measures for reduction of exposure and special advice for children to consider the mobile phone as a tool for communication to be used when necessary, and not as a toy.

ANNEX: Quoted references

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